Claims

1. A improved spectrographic system with a plasma source, system including:

a spectrographic system with a plasma source, including a window for collection of emitted radiation from plasma generated by the plasma source;

a supplemental gas source that supplies ionizable gas to the plasma source, independent of gas analyzed by the spectrographic system; and

control logic to activate the gas source and energize the plasma source for a time sufficient to clean the window, while the spectrographic system is otherwise idle.

2. The spectrographic system of claim 1, wherein the ionizable gas contains nitrogen.

3. The spectrographic system of claim 1, wherein the ionizable gas contains oxygen.

4. The spectrographic system of claim 1, wherein the spectrographic system is utilized to monitor a deposition process and the control logic activates the gas source and the plasma source in a self-cleaning process shortly after monitoring the deposition process.

5. The spectrographic system of claim 1, wherein the gas source supplies the ionizable gas to a common inlet to the plasma source.

6. The spectrographic system of claim 1, wherein the gas source supplies the ionizable gas to additional inlet to the plasma source, proximate to the window.

7. The spectrographic system of claim 1, wherein the control logic energizes the plasma source with more energy than used for spectrographic analysis.

8. An spectrographic system with a plasma source, the improved system including:

a spectrographic system with a plasma source, including a window for collection of emitted radiation from plasma generated by the plasma source;

wherein the spectrograph system is used to monitor a process that includes a process step and a purge step; and

control logic to energize the plasma source during the purge step for a time sufficient to clean the window of materials from the process step.

9. The spectrographic system of claim 8, wherein the purge gas contains nitrogen.

10. The spectrographic system of claim 8, wherein the purge gas contains oxygen.

11. The spectrographic system of claim 8, wherein the control logic energizes the plasma source with more energy for self-cleaning than used for spectrographic analysis.

12. An spectrographic system with a plasma source, the improved system including:

a spectrographic system with a plasma source, including a window for collection of emitted radiation from plasma generated by the plasma source; and

one or more heating elements that apply sufficient heat for the window to remain substantial clear of deposited material.

13. The spectrographic system of claim 12, wherein the heating elements are proximate to the window and applies heat in a vicinity of the window.

14. The spectrographic system of claim 12, wherein the plasma source includes an excitation chamber and the heating elements are proximate to and applies heat to the excitation chamber and the window.

15. The spectrographic system of claim 12, further including an exhaust sample line in gaseous communication with the plasma source, wherein the heating elements apply heat to the exhaust sample line.

16. A method of analyzing conditions within a reactor chamber during operation of a process, including:

characterizing exhaust gas from the reaction chamber during the operation of the process utilizing a plasma source and a spectrographic detector array.

17. The method of claim 16, wherein the spectrographic detector array is sensitive to at least 512 wave bands.

18. The method of claim 16, wherein the spectrographic detector array includes at least 512 detectors.

19. The method of claim 16, wherein the spectrographic detector array is sensitive to at least 1024 wave bands.

20. The method of claim 16, wherein the spectrographic detector array includes at least 1024 detectors.

21. The method of claim 16, further including:

characterizing exhaust gas from an additional reaction chamber during the operation of a replicated process utilizing a plasma source and a spectrographic detector array; and

adjusting conditions of the additional reaction chamber responsive to differences between the characterizations of the reaction chamber and the additional reaction chamber.

22. The method of claim 21, wherein adjusting the conditions includes cleaning walls of the additional reaction chamber.

23. The method of claim 22, wherein adjusting the conditions further includes running test wafers with process chemicals in the additional reaction chamber.

24. The method of claim 22, wherein adjusting the conditions further includes generating plasma containing hydrogen in the additional reaction chamber to diffuse hydrogen into walls of the additional reaction chamber.

25. A method of analyzing conditions within a reactor chamber during flow of a non-reactive gas, including:

characterizing exhaust gas from the reaction chamber during the non-reactive gas flow utilizing a plasma source and a spectrographic detector array.

26. The method of claim 25, wherein the spectrographic detector array is sensitive to at least 512 wave bands.

27. The method of claim 25, wherein the spectrographic detector array includes at least 512 detectors.

28. The method of claim 25, wherein the spectrographic detector array is sensitive to at least 1024 wave bands.

29. The method of claim 25, wherein the spectrographic detector array includes at least 1024 detectors.

30. The method of claim 25, further including monitoring desorption of a material from walls of the reaction chamber.

31. The method of claim 25, further including monitoring diffusion of a material from walls of the reaction chamber.

32. A method of controlling operation of a reactor chamber during operation of a process, including:

modifying operating parameters of the process responsive to a multi-band spectrographic analysis of exhaust gas from the reaction chamber during the operation of the process.

33. The method of claim 32, wherein the multi-band spectrographic analysis includes producing a plasma outside the reaction chamber and analyzing emissions from the plasma utilizing a spectrographic detector array.

34. The method of claim 32, wherein the reaction chamber utilizes a rotating magnetic field to energize a reaction plasma and producing the plasma outside the reaction chamber is isolated from the rotating magnetic field.

35. The method of claim 32, wherein the multi-band spectrographic analysis includes combining measurements of a plurality of the multiple bands corresponding to a spectrographic peak.

36. The method of claim 35, wherein the multi-band spectrographic analysis further includes combining measurements of a plurality of spectrographic peaks corresponding to a compound.

37. The method of claim 32, wherein the process includes cleaning walls of the reaction chamber, the multi-band spectrographic analysis includes wave bands representing at least two reactants, one of which is depleted from the walls and another of which is supplied to the reaction chamber during the process.

38. The method of claim 37, further including detecting a change in intensity of at least one wave band representing the reactant that is depleted from the walls.

39. The method of claim 37, further including detecting a change in intensity of at least one wave band representing the reactant that is supplied to the reaction chamber.

40. A method of monitoring conditions inside a reaction chamber, including:

capturing a multi-band spectrograph of exhaust gas from the reaction chamber during the operation of a process;

determining a plurality of peaks present in the multi-band spectrograph;

comparing the peaks present to a set of reference peaks.

41. The method of claim 40, wherein the set of reference peaks includes peaks representing normal operation of the process, further including reporting significant deviations in the multi-band spectrograph from the reference peaks.

42. The method of claim 40, wherein the set of reference peaks includes peaks representing abnormal operation of the process, further including reporting matches between the multi-band spectrograph and the reference peaks.

43. The method of claim 40, further including subtracting from the multi-band spectrograph a reference spectrograph, before determining the plurality of peaks present.

44. The method of claim 43, wherein the set of reference peaks includes peaks representing normal operation of the process, further including reporting significant deviations in the multi-band spectrograph after subtracting from the reference peaks.

45. The method of claim 43, wherein the set of reference peaks includes peaks representing abnormal operation of the process, further including reporting matches between the multi-band spectrograph after subtracting and the reference peaks.

46. A method of monitoring environmental discharges, including:

capturing a multi-band spectrograph of exhaust gas from a reaction chamber during the operation of a process; and

determining a concentration of an environmentally sensitive substance in the exhaust gas from the multi-band spectrograph.

47. The method of claim 46, wherein the reaction chamber handles wafers.

48. The method of claim 46, wherein the reaction chamber is a scrubber.

49. The method of claim 46, wherein the reaction chamber is an abatement tool.

50. The method of claim 46, further including capturing exhaust gas flow data and determining a mass of the environmentally sensitive substance in the exhaust gas.

51. A system for monitoring at least one environmentally sensitive substance in exhaust streams from a plurality of abatement reaction chambers in gaseous communication with a plurality of wafer handling reaction chambers, including:

a plurality of spectrographic systems having plasma sources, coupled in gaseous communication with the abatement reaction chambers; and

one or more data collection and recording devices coupled in data communication with the spectrographic systems.

52. The system of claim 51, further including a user interface to select at least a portion of the recorded data from one or more selected abatement reaction chambers to play back.

53. A system for monitoring at least one environmentally sensitive substance in exhaust streams from a plurality of wafer handling reaction chambers and a plurality of abatement reaction chambers in gaseous communication with the wafer handling reaction chambers, including:

a plurality of spectrographic systems having plasma sources, coupled in gaseous communication with the exhaust gas streams of the wafer handling reaction chambers and the abatement reaction chambers; and

one or more data collection and recording devices coupled in data communication with the spectrographic systems.

54. The system of claim 53, further including a user interface to select at least a portion of the recorded data from one or more selected wafer handling reaction chambers and/or abatement reaction chambers for play back.

55. The system of claim 53, further including a user interface to locate exhaust excursions among the recorded data from one or more selected wafer handling reaction chambers and abatement reaction chambers during a selected time period.